



The TRIUMF Newsletter

News from Canada's National Laboratory for Particle and Nuclear Physics

ICFA Meeting at TRIUMF

Two meetings of international organizations representing the particle physics field were held at TRIUMF on 10/11 February 2005. The International Committee for Future Accelerators (ICFA) is an organization in which discussions can take place on international aspects of particle physics, in particular the large accelerators that are at the heart of this field. The Committee's 16 members are approximately representative of particle physics activities in the different regions of the world. ICFA met on the evening of 10 February and all day 11 February. In addition to Committee members, directors of major world particle physics laboratories were also invited to the meeting. The 15-member International Linear Collider Steering Committee (ILCSC) is a subcommittee of ICFA whose primary role is to promote the construction of an electron-positron linear collider through world-wide collaboration; it met on 10 February.

The major (although not only) item on the agendas of both meetings was the selection of a director for the International Linear Collider Global Design Effort; this is the body which will coordinate the world's linear collider design and R&D efforts, at least until a group of governments formally take over this task. ILCSC had organized a search for a director, and an ILCSC subgroup had evaluated and interviewed candidates. On 10 February, ILCSC interviewed the leading candidate and then made a recommendation for an offer, which was subsequently approved by ICFA on 11 February. On 18 March 2005, it was announced that Barry Barish of Caltech had accepted the position.

The Chairs of both ICFA and ILCSC wish to thank TRIUMF for its kind and warm hospitality. • *Roy Rubinstein (Fermilab) Secretary, ICFA and ILCSC*

For more information on ICFA, visit the website at: http://www.fnal.gov/directorate/icfa/icfa_home.html

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NSERC presented a 2004 Synergy Award for Innovation to TRIUMF and MDS Nordion for their 26 year university-industry partnership for the production of medical isotopes.



Photo courtesy of Prisk Studios Limited

The award was received from NSERC by representatives from TRIUMF and MDS Nordion at a ceremony in Waterloo, Ontario. (from left to right) J.Porter (MDS), G. Maloske (MDS), T. Brzustowski (NSERC President), J.M. Poutissou (TRIUMF), P. Gardner (TRIUMF), A. Shotter (TRIUMF Director), I. Trevena (MDS) and B. Pate (TRIUMF-retired).

DIRECTOR'S NOTES

In the Federal Government's March budget announcement, TRIUMF was pleased to learn that the government had agreed to renew TRIUMF's current 5-year (2000-2005) funding for a further 5-year period (2005-2010). The laboratory and the community it serves are very grateful for this support and indication of confidence in the laboratory's mission. The funds allocated for the 2005-2010 period will not be enough to cover all the projects identified in the original plan as submitted, so some prioritization will be needed as well as the pursuit of extra funds for specific projects.

Congratulations to the ATLAS Canada group for having successfully passed a major milestone in the construction and installation of the End Cap calorimeters of the ATLAS detector at CERN. The first of the two End Caps has been successfully tested in its cryostat at liquid argon temperature (86K) and is presently being readied for transport to its final location in the ATLAS pit. The first End Cap is scheduled to be lowered into the pit during the summer, and the second one will be lowered in November this year.

Congratulations are also due to the TRILIS team that in December 2004

produced the first radioactive beam from an ion source based on the resonant ionization method at TRIUMF. This was a major achievement since the ion source produced its first beam well ahead of schedule. Jens Lassen, the TRILIS groups leader, describes in this newsletter how this ion source opens up possibilities for many new radioactive beams at TRIUMF.

As mandated by the government, TRIUMF has the responsibility of transferring its technical expertise to the benefit of society. Over many years, TRIUMF has built a highly successful collaboration with its commercial partner MDS Nordion. This partnership is now responsible for delivering over 2.5 million patient radiation treatments per year for either therapy or diagnostic purposes. In recognition of this outstanding record, the Natural Sciences and Engineering Research Council presented a 2004 Synergy Award to the partnership (see photo above). The award money will be used to help support students in the life sciences. •

Alan Shotter, TRIUMF Director

For more information on TRIUMF Projects, visit the TRIUMF website at: <http://www.triumf.info>

Laser Ion Source's First Radioactive Beam at ISAC

TRILIS, "TRIUMF's Resonant Ionization Laser Ion Source" adds several tunable, pulsed lasers to the surface ionization source, such that all complexity of TRILIS is serviceable and far removed from the high temperature, radiation environment of the isotope production target. The delivery of 1.5×10^3 atoms/s of ^{62}Ga (116 ms half-life) from the target-resonant laser ion source combination demonstrates the new possibilities for beam delivery, with an intensity enhancement of $2\times$, combined with a $20\times$ suppression of the ^{62}Cu isobaric contaminant over pure surface ionization.

This marks an important milestone for the isotope separator and accelerator facility (ISAC) as this opens up the availability of a wide range of radioactive isotopes that previously could not be ionized. Figure 1 shows that on top of the alkali metals and alkaline earths, now also most of the transition metals, lanthanides and actinide elements can be ionized. Thus more elements from the isotope production of the ISAC targets can be extracted as ion beams for experiments.

The technique of "Resonant Ionization Mass Spectrometry", with its high selectivity and sensitivity, is key to the new laser ion source. Unlike conventional ion sources, resonant laser ionization uses the optical spectroscopic fingerprint for each element to provide selective ionization. Element-selective ionization, combined with the ISAC mass-separator provides new isotope beams of superior purity – which is essential to many high precision nuclear physics measurements.

The opportunity presented by the on-line test for TRILIS beam was seized by the 8π nuclear spectroscopy collaboration to measure the unknown nuclear branching ratios of ^{62}Ga . About one year ahead of schedule TRILIS proves that state of the art, all solid-state laser systems are capable of providing the laser power and reliability needed for on-line ion-source operation. This has been the first time that such an all solid-state laser system has been used for on-line production of radioactive beams. The high repetition-rate, tunable, titanium:sapphire (TiSa) lasers are a special development for

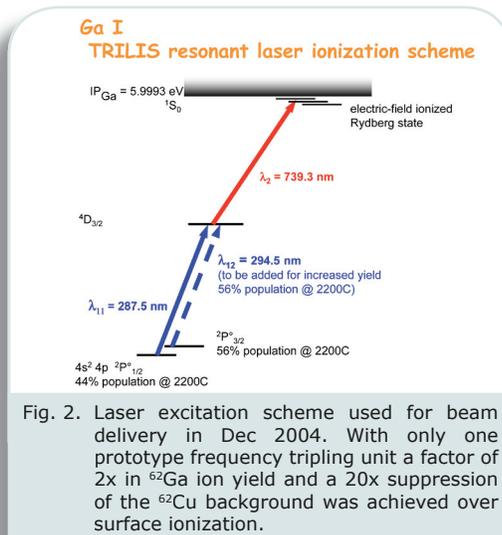


Fig. 2. Laser excitation scheme used for beam delivery in Dec 2004. With only one prototype frequency tripling unit a factor of $2\times$ in ^{62}Ga ion yield and a $20\times$ suppression of the ^{62}Cu background was achieved over surface ionization.

laser ion sources by our collaborators at the University of Mainz (Germany). The joint laser development continues.

The successful laser ion source operation shows that LIS beam development can proceed for a host of new beams. Schemes for TiSa laser based ionization of Sn, Ni, Ca, Tc, Ga, Ge have been established. One such scheme is shown in Figure 2. With TRILIS operational, ISAC is can develop and produce new radioactive ion beams of high intensity and purity, thus allowing TRIUMF-ISAC to continue to be one of the leading radioactive ion beam facilities. •

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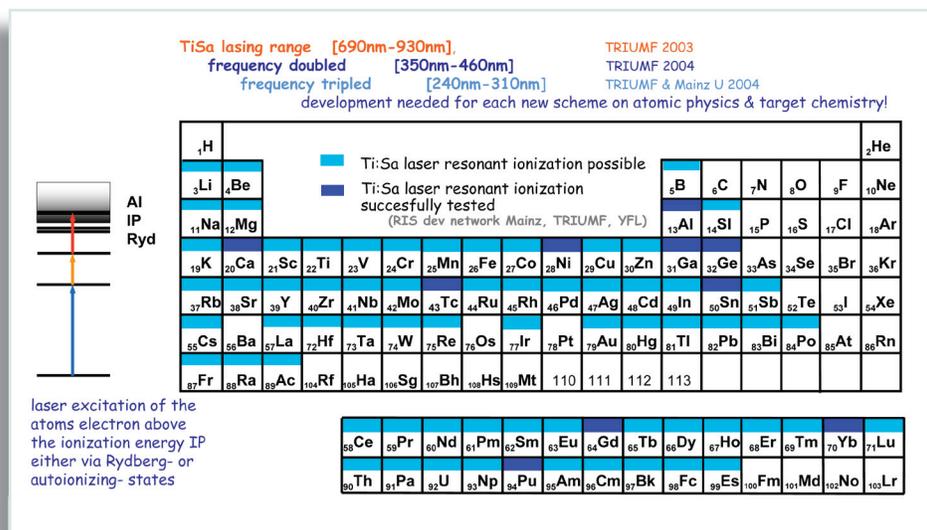
Jens Lassen

TRIUMF's Contributions

The Standard Model (SM) of particle physics is such a successful theory that a great deal of experimental effort is focused on finding results the theory cannot explain. The search for "physics beyond the Standard Model" has become a crusade-like quest, and it seems that physicists have seen their first glimpse of the promised land: the neutrino, long thought to be massless, actually has a tiny mass.

Neutrinos are fundamental subatomic particles, which interact with matter only via the weak-interaction. For example, they are produced when neutrons or protons decay inside a radioactive nucleus. In the SM there are three types (or flavours) of massless neutrinos, which always maintain their identity (flavour conservation). However, if neutrinos have mass, as they travel they can oscillate through quantum mechanical interference from one flavour type to another, and back again. Proving the existence of neutrino oscillations would show that neutrinos have mass, and that lepton flavour is in fact not conserved.

Such convincing evidence recently has been obtained in measurements of neutrinos produced in the sun (solar neutrinos), nuclear reactors, and in the upper atmosphere (atmospheric neutrinos) by experimental groups in Japan and at the Sudbury Neutrino observatory (SNO) in Ontario.



to the T2K Collaboration in Canada

These experiments gave the first evidence of physics beyond the SM, and the very light neutrino masses (compared to charged leptons) implied by the data indicates new physics effects at an extremely high energy scale, such as grand unification or extra dimensions of space-time.

Measuring the solar and reactor neutrino (atmospheric) oscillations has provided the coupling between first and second (second and third) flavours of neutrinos, $\theta_{12}(\theta_{23})$ respectively. The next step is an experiment to determine the remaining parameters describing neutrino oscillation (the so-called MNSP matrix), including the coupling between first and third flavour (θ_{13}) and its complex CP-violating phase (Δ_{CP}), which will help shed light on the unknown very high energy scale physics.

The most promising avenue for measuring the MNSP parameters is to study neutrino oscillations using so-called “superbeams” -- high intensity neutrino beams derived from the decays of pions. The Japanese T2K experiment will send a neutrino beam from a new 1 megawatt accelerator at JPARC (Japan Proton Accelerator Research Complex) in Tokai to the world largest water Čerenkov detector hundreds of kilometres away at Super-Kamiokande (Fig.1). The project has been approved by the Japanese government and the neutrino beamline construction started in April 2004. The commissioning of the J-PARC accelerator is scheduled for 2008 and the first T2K neutrino beam is expected in the spring of 2009.

The T2K collaboration in Canada consists of scientists and students at TRIUMF, the Universities of Alberta, UBC, Carleton, Montreal, Toronto, Victoria, and York. Among the earliest collaborators, the Canadian group introduced essential design concepts, such idea of the $\nu_{\mu} \rightarrow \nu_e$ oscillation analysis and narrow band off-axis beam, and contributed to the accelerator beam dynamics study, dual abort/extraction kicker design, and the combined

function magnet design. Japanese T2K scientists visited TRIUMF to tap our expertise in beamline and target station design. Neutrinos are produced by a high intensity proton beam, which hits a target, creating pions, which decay subsequently producing neutrinos ($\pi \rightarrow \mu \nu$). The target station, where much of the mega-watt beam energy is released, will require full remote maintenance similar to the (much smaller) ISAC target station at TRIUMF. Detailed engineering design of the target station is in progress and TRIUMF is expected to contribute to the remote handling and shielding designs. Other accelerator components like the beam damper system in the main ring, the extraction kicker magnet, and radiation hard magnets are also being considered as potential TRIUMF contributions.

The neutrino source will be monitored at three locations (the primary proton beam monitor, the muon monitor at the beam dump, and an on-axis neutrino monitor), which are essential to understand and control the neutrino beam. The Canadian group is responsible for providing a proton beam profile monitor in front of the target based on an optical transition radiation (OTR)

Fig.1. High intensity neutrino beam will be sent from the new neutrino beamline at J-PARC facility to the Super-Kamiokande detector which is located 295 km away.

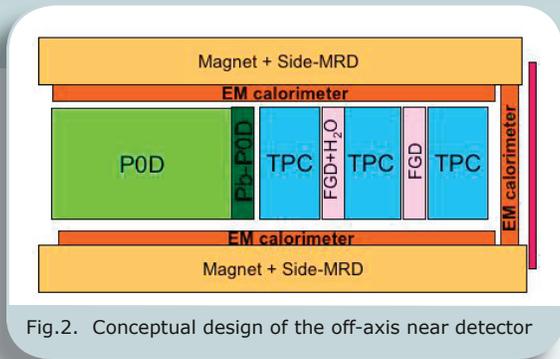
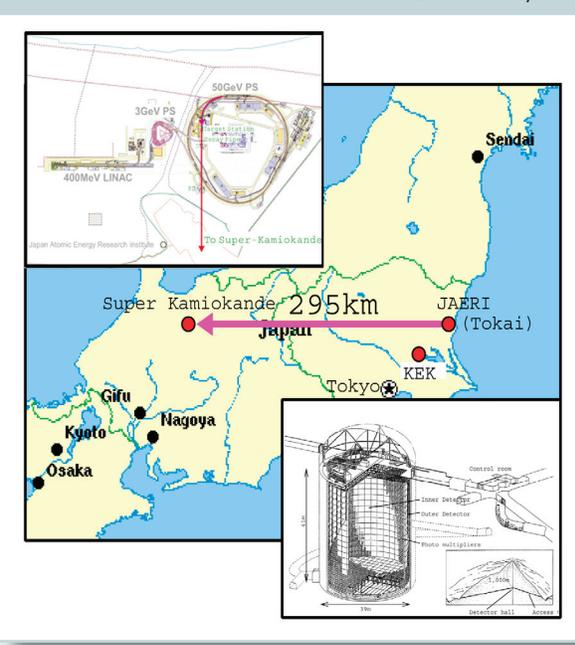


Fig.2. Conceptual design of the off-axis near detector

detector, and for the muon monitor based on an array of diamond sensors. OTR detectors have been used for electron machines and recently adopted for proton machines at CERN and FNAL, and are likely the only monitors that would work in the target's extremely high radiation environment. The diamond sensor has been tested successfully at a current neutrino beam line at KEK.

Neutrino oscillations are observed by measuring neutrino flux in the far detector, Super-Kamiokande, compared with that in an off-axis near detector placed in the same direction as the far detector. The off-axis near detector will consist of fine-grained calorimeters (FGD) and time projection chambers (TPC), and an electromagnetic calorimeter, all placed inside a large dipole magnet formerly at CERN (Fig.2). The Canadian group is in charge of the three 2.4m × 2.4m × 0.9m TPCs, and of a FGD based on water-soluble scintillator. The FGD also acts as a neutrino target, with a granularity of about 1cm × 1cm required to be able to detect recoil protons from the quasi-elastic scattering process, $\nu_{\mu} n \rightarrow \mu^{-} p$. Because the far detector is water, near-detector scintillator with high water content is desired. By adding a surfactant, we have achieved 70% water content with water soluble scintillator contained in 1cm × 1cm corrugated polypropylene panels. The emitted light is read out by wavelength shifting fibers, perhaps to be read out with multipixel Geiger-mode avalanche photodiodes. R&D for the scintillator and photosensor are underway. Prototypes of both the TPC and the water-soluble scintillator will be constructed and tested at TRIUMF this year. •

Akira Konaka

For more information about the T2K collaboration, visit the website at: <http://neutrino.kek.jp/jhfnu/>

First Determination of the ^{11}Li Nuclear Charge Radius

Nuclear physicists discovered twenty years ago that some of the lightest nuclei can have a matter radius as large as those found in the heaviest naturally occurring elements [1]. This was explained by weakly bound nucleons that form a dilute cloud around a central nuclear core [2]. Such a structure is called a neutron halo. A schematic picture for the structure of the two-neutron halo nucleus ^{11}Li is shown in Figure 1. The wave-function of the halo neutrons extends far away from the ^9Li core, much further than it would be classically allowed. Indeed the neutrons spend more than half of the time outside the range of the strong nuclear force. These findings initiated a new field of nuclear physics research. The most prominent representatives of halo nuclei are ^{11}Li , ^6He , ^{11}Be , and ^8B . The halo structure is particularly sensitive to the effective forces acting between nucleons, and the charge radius of these nuclei provides important information about the influence of the halo on the nuclear core. However, the charge radius of the most famous halo nucleus ^{11}Li cannot be measured by the usual method of electron scattering because the abundance of this isotope is too low and its lifetime is too short (only 8 milliseconds). In a combined effort of theoretical and experimental atomic physics, an international collaboration with groups from Germany, Canada, and the US has overcome both theoretical and experimental difficulties. They developed a sensitive and accurate method to determine the charge radius via a measurement of the isotope shift – the change in an electronic transition frequency between isotopes.

Normally, this method cannot be applied to radioactive isotopes of elements lighter than sodium because the tiny effect of the charge radius on the transition frequency cannot be separated from other mass-dependent corrections to the electronic energy levels. On the theoretical side, the intractable problem had to be solved to calculate the three-electron energy levels to the required accuracy of 1 part

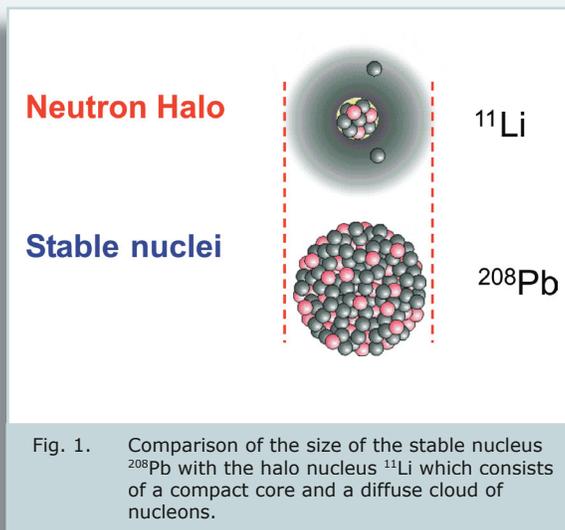


Fig. 1. Comparison of the size of the stable nucleus ^{208}Pb with the halo nucleus ^{11}Li which consists of a compact core and a diffuse cloud of nucleons.

in 10^9 , including the combined effects of electron correlation, relativity and quantum electrodynamics [3]. On the experimental side, a method was developed at GSI Darmstadt (Germany) that is both very accurate and extremely sensitive and is able to handle the small production rates and the short lifetime of ^{11}Li . [4] In June 2004 the experiment was installed at TRIUMF in the ISAC experimental hall. After first tests with ^9Li in September, a ^{11}Li beam of approximately 35,000 ions/s was delivered by the ISAC surface ion source during the beamtime in October 2004. With an overall efficiency of 10^{-4} , resonance signals like that shown in Figure 2 were recorded within 15 minutes. Analysis of these curves will result in the first model-independent value for the charge radius of ^{11}Li . It will provide a critical test of nuclear models that have been proposed for the effective forces holding this fragile halo structure together. It is of great interest because the understanding of effective nuclear forces is important to determine, for example, the structure of neutron stars or the pathways of stellar nucleosynthesis to form the elements of which we are made. •

Wilfried Nörtershäuser

TRIUMF's Testing of the

Normal muon decay ($\mu^+ \rightarrow e^+ \nu_e \bar{\nu}_\mu$) is an ideal process to investigate the electroweak interaction in the Standard Model. The reaction involves only leptons, obviating the need for uncertain strong interaction corrections, thus making it a clean probe of the theory's purely left-handed ($V-A$) structure. A high-precision determination of the parameters describing the muon decay spectral shape explores physics possibilities beyond the Standard Model, for example those involving right-handed interactions. The world's most precise such determination has been the goal of the TRIUMF Weak Interaction Symmetry Test (TWIST). The collaboration has recently completed its first phase by directly measuring the muon decay parameters ρ and δ , improving on the accepted Particle Data Group (PDG) values for the two spectral shape parameters by

1. I. Tanihata, H. Hamagaki, O. Hashimoto, Y. Shida, N. Yoshikawa, K. Sugimoto, O. Yamakawa, T. Kobayashi, and N. Takahashi, *Physical Review Letters*, 55 (1985) 2676-2679.
2. P.G. Hansen and B. Jonson, *Europhysics Letters*, 4 (1987) 409-414.
3. Z.-C. Yan and G.W.F. Drake, *Physical Review A*, 61 (2000) 022504.
4. G. Ewald, W. Nörtershäuser, A. Dax, S. Götze, R. Kirchner, H.-J. Kluge, T. Kühl, R. Sanchez, A. Wojtaszek, B.A. Bushaw, G.W.F. Drake, Z.-C. Yan, and C. Zimmermann, *Physical Review Letters*, 93 (2004) 113002.

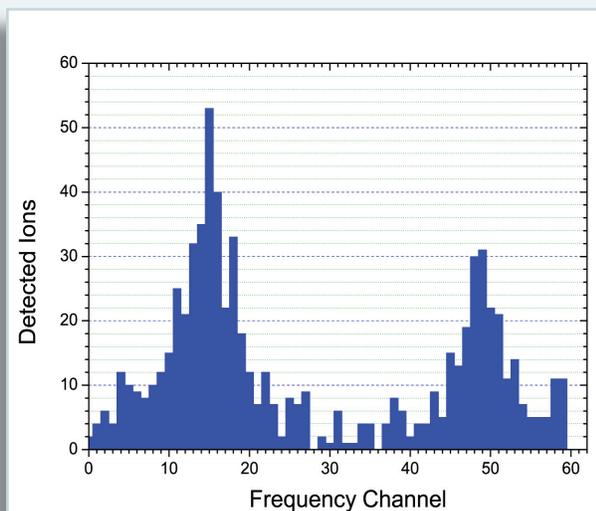


Fig. 2. Laser-induced resonance signal of ^{11}Li .

Standard Model in Muon Decay

factors of 2.5 (ρ) and 2.9 (δ) [1, 2].

The four so-called “Michel parameters” describe the distribution in energy and angle of positrons from polarized muon decay. The spectrum’s isotropic part has a momentum dependence determined by ρ plus an additional small term proportional to a second parameter, η . The asymmetry is proportional to a third parameter ξ multiplied by the muon polarization, P_μ , while a fourth parameter, δ , determines its momentum dependence. Within the Standard Model, these parameters are predicted to be $\rho=3/4$, $\delta=3/4$, $\xi=1$, and $\eta=0$.

Beams of positive muons are used by TWIST since they can be produced with high polarization and high stopping density. The high intensity TRIUMF proton beam produces π^+ , some of which decay at rest at the surface of a production target to create a highly polarized “surface” muon beam with momentum 29.6 MeV/c, which is subsequently transported into a 2T superconducting solenoid. A schematic diagram of the TWIST spectrometer is shown in Figure 1.

Most of the muon beam stops in a thin target, located at the center of a symmetric array of 56 low mass, high precision planar drift chambers. Limitations on final errors are dominated by systematic effects since the statistical precision is very high.

The measured momentum and angle distribution of the decay positrons is shown in Figure 2. The drop in acceptance near $|\cos\theta|=0$ is due to the poor reconstruction efficiency in that region. To extract the muon decay parameters, a two-dimensional fit is made to a fiducial region where the detector acceptance is essentially uniform, utilizing a blind analysis technique. The results are based on 6×10^9 muon decays, spread over sixteen data sets. Four sets were analyzed for both ρ and δ . A fifth set of low polarized muons from pion decays in flight was also analyzed for ρ . The remaining data sets, combined with further MC simulations, were used to estimate the sensitivities to various systematic effects.

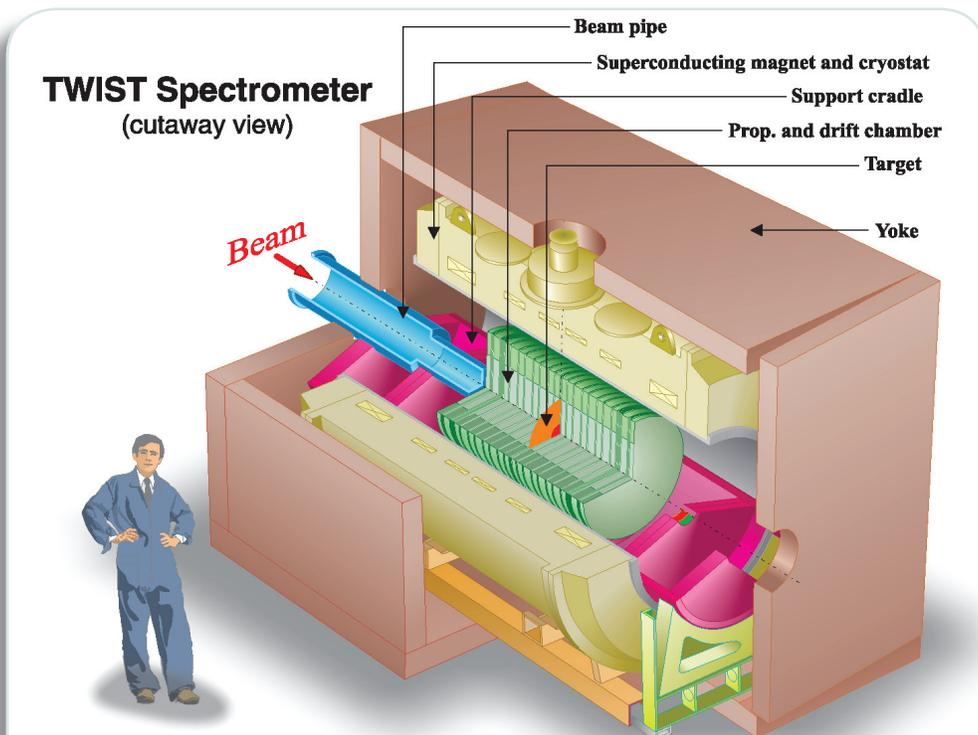


Fig. 1. Schematic diagram of TRIUMF’s TWIST muon-decay spectrometer

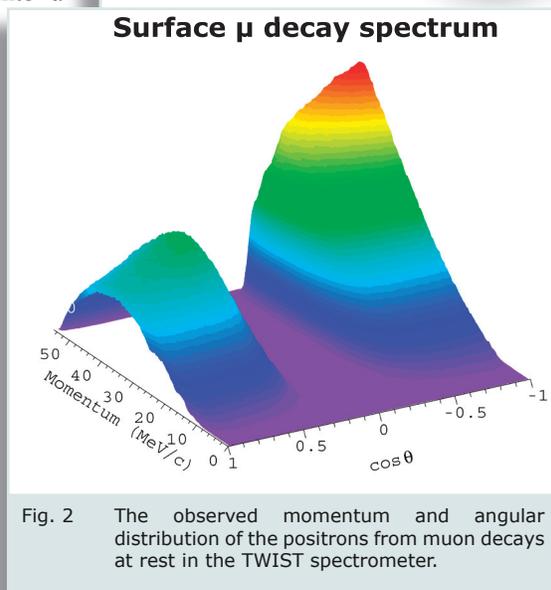


Fig. 2 The observed momentum and angular distribution of the positrons from muon decays at rest in the TWIST spectrometer.

TWIST’s new measurement of $\rho=0.75080 \pm 0.00032(\text{stat.}) \pm 0.00097(\text{syst.}) \pm 0.00023$ (last uncertainty due to the current PDG error in η) sets an upper limit on the mixing angle of a possible heavier right-handed partner to the W boson, $|\zeta| < 0.030$ at 90% c.l. Combining ρ with the new measurement of $\delta = 0.74964 \pm 0.00066(\text{stat.}) \pm 0.00112(\text{syst.})$, and the PDG value of $P_\mu \xi \delta / \rho$, an indirect limit is set on $P_\mu \xi$: $0.9960 < P_\mu \xi \leq \xi < 1.0040$

with 90% c.l. The lower limit $0.9960 < P_\mu \xi$ slightly improves the limit on the mass of the possible right-handed boson, $W_R \geq 420 \text{ GeV}/c^2$. Finally, an upper limit is found for the muon right-handed coupling probability, $Q_R^\mu < 0.00184$ at 90% c.l.

Muon decay, combined with complementary measurements from experiments at higher energies and in nuclear beta decay, help our understanding of the asymmetry in the weak interaction’s handedness and whether symmetry may be restored at higher energy scales. In the future phases of the experiment, TWIST aims to produce a direct measurement of $P_\mu \xi$ with a precision of few parts in 10^4 and to increase its sensitivity to ρ and δ by approximately another factor of five. •

Mina Nozar

- 1 J.R. Musser et al, Phys. Rev. Lett. 94, 101805 (2005), hep-ex/0409063.
- 2 A. Gaponenko et al, Phys. Rev. D 71, 071101(R) (2005), hep-ex/0410045.

For more information about the TWIST experiment, visit the website at: <http://twist.triumf.ca>

Phytoplankton Research May Help Battle Global Warming

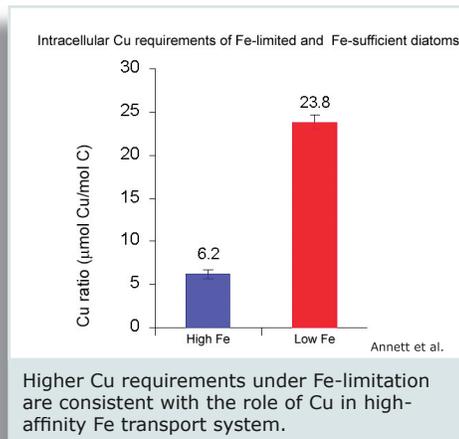
With help from TRIUMF's Positron Emission Tomography (PET) Group, Dr. Maria Maldonado of the University of British Columbia (UBC) is conducting research that may provide a scientific basis for emerging strategies aimed at controlling global warming. Dr. Maldonado holds a Canada Research Chair in Phytoplankton Trace Metal Physiology, and is an Assistant Professor in UBC's Earth and Ocean Sciences department. She is studying how copper (Cu) affects carbon dioxide (CO₂) uptake in phytoplankton. Phytoplankton are microscopic 'aquatic plants'. Like plants, phytoplankton take in CO₂ and through photosynthesis, convert it into sugars that they can consume as food. It is through photosynthesis that phytoplankton play an integral role in regulating atmospheric CO₂ levels. Without phytoplankton, the Earth's atmospheric CO₂ level would be significantly higher than the 360 parts per million we observe today.

Dr. Maldonado warns that despite CO₂ uptake by phytoplankton, global CO₂ levels are rising. "Over the past century, industrial emissions of CO₂ have resulted in an exponential increase in atmospheric CO₂ to values not seen on earth in at least

the last approximately 400,000 years," she explains.

When fossil fuels are consumed in cars and industrial processes, CO₂ and other greenhouse gases that contribute to global warming are produced. Some believe that climate change can be mitigated by actively stimulating greater CO₂ uptake in phytoplankton by adding specific nutrients, such as iron (Fe), to ocean waters.

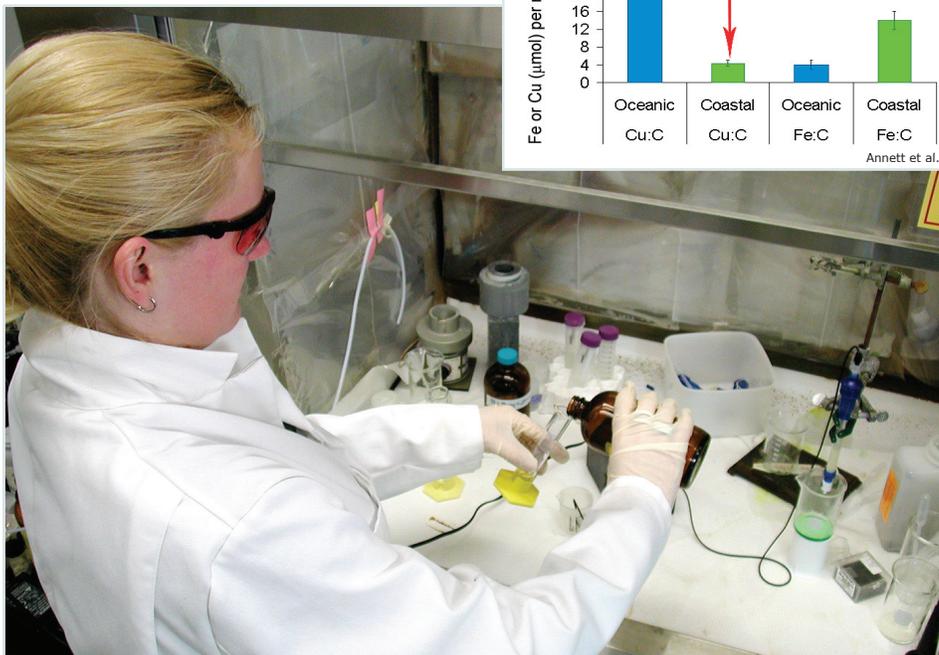
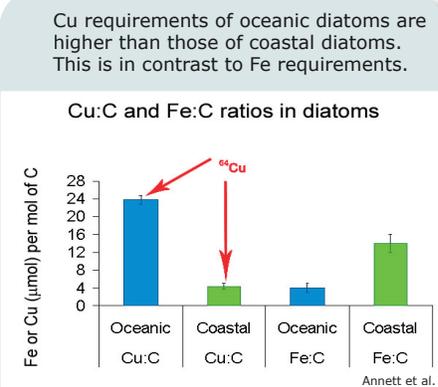
Scientific research has indicated that Fe supports phytoplankton growth and efficient CO₂ uptake. However, Dr. Maldonado's preliminary research suggests that in waters with very low concentrations of Fe, such as in parts of the Subarctic Pacific and Southern Oceans, Cu may act as a substitute for Fe. Furthermore, Cu appears to facilitate Fe uptake and influence photosynthesis in these conditions. Dr. Maldonado, along with UBC students Shannon Harris and Amber



Annett, are one of only a handful of teams studying this phenomenon, and are the first to demonstrate the important physiological role of Cu in Fe uptake in these tiny aquatic marine organisms.

TRIUMF has thus far been providing the copper radioisotope ⁶⁴Cu for this study; however, with cooperation from MDS Nordion, TRIUMF will soon provide ⁶⁷Cu, as it has a much longer half-life than ⁶⁴Cu (2.58 days versus 12.4 hours). The longer half-life will enable the UBC researchers to take the tracer to sea for studies with on-site ocean water. Suzy Lapi, an SFU Ph.D. student working at TRIUMF, and Dr. Tom Ruth, Director of the TRIUMF-UBC PET Program, produce the copper isotopes. Over the course of the year, Dr. Maldonado's team will use these isotopes to investigate the distribution of Cu in the various cellular compartments of the phytoplankton to determine possible biochemical substitutions of Fe by Cu. Following this, the actual mechanisms of Cu uptake and kinetics of Cu transport in phytoplankton will be examined. The group plans to publish its findings by the end of this year. •

Patrick Lee



SFU Chemistry Ph.D. student Suzy Lapi prepares a sample of ⁶⁴Cu for use in Dr. Maria Maldonado's phytoplankton research.



TRIUMF Canada's National Laboratory for Particle & Nuclear Physics

Technology Transfer Bulletin

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For more information about Applied Science at TRIUMF, visit the Technology Transfer website at:

http://www.triumf.info/public/tech_transfer/tech_transfer_5.php

TRIUMF and the World Year of Physics

This year physicists around the world are celebrating the 100th anniversary of Albert Einstein's annus mirabilis, when as a patent clerk working in Bern, Switzerland, he published 4 papers that revolutionized physics. To commemorate Albert Einstein's extraordinary scientific legacy, the United Nations General Assembly proclaimed 2005 to be the World (or International) Year of Physics (WYP2005), when physicists world-wide are sharing their vision and passion for physics with the general public through lectures, open houses, science fairs, and other events. The Canadian Association of Physicists (CAP) is leading the WYP2005 in Canada, and TRIUMF is playing a central role in event planning, with Outreach Coordinator Marcello Pavan on the national WYP2005 organizing committee, and Associate Director Jean-Michel Poutissou co-chair of the local organizing committee for the CAP Congress 2005, to be held June 5-9 at the University of British Columbia (UBC) in Vancouver.



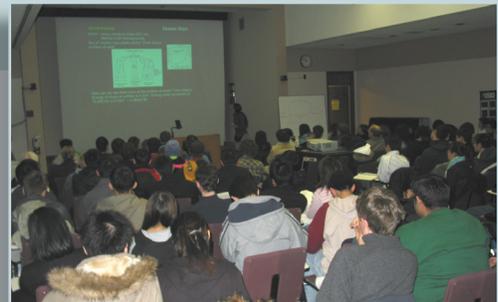
The CAP Congress will be the centrepiece of Canadian WYP2005 celebrations. It will be launched at UBC's Chan Centre with the public Herzberg Memorial Lecture by (Canadian) Clifford Will of Washington University in St. Louis. An expert in general relativity and cosmology, Professor Will's lecture subsequently will be repeated in a fall cross-country tour. Immediately preceding the Herzberg Lecture, UBC's critically acclaimed Borealis String Quartet will be premiering a new work specially composed for the Congress by University of Alberta physics

PhD and music composition student Aaron Hryciw.

TRIUMF and the UBC Physics department will open their doors to host an open house on Saturday June 4, when the general public is invited to come and visit the laboratories and whet their physics appetites. Planning is at an early stage so those interested should visit the TRIUMF web page periodically for event details.

TRIUMF has been involved in organizing and supporting public lectures designed to popularize the wonders of Einstein's scientific legacy. Cosmologist Rocky Kolb of the University of Chicago gave a lecture Feb. 28 to a packed audience at the Harbour Centre in downtown Vancouver. April 16, the TRIUMF-sponsored Vancouver Institute lecture will be by Barry Barish (a member of the U.S. National Science Board) on Einstein's legacy in gravitational physics. Former TRIUMF Director Erich Vogt will give the Ovenden Memorial lecture at Vancouver's H.R. MacMillan Space Centre April 18 on Einstein's role in the development of modern physics. Professor Vogt had met Einstein personally, and so will be peppering his talk with personal anecdotes of their interactions. Professor Vogt will preview his talk for the final Saturday Morning Lecture (SML) series event April 16 in the TRIUMF auditorium. The SML series has focused on the modern legacy of Einstein's famous 1905 papers and has been very well received. The program will continue in the fall, not only at TRIUMF but in other B.C. communities as well. Additional public lectures covering Einstein's legacy are also planned for the autumn months.

Enhancing physics education opportunities is a key goal of the WYP2005, and TRIUMF is actively involved in events targeted specifically to high-school students and teachers. The CAP Division of Physics Education, the BC Association of Physics Teachers (BCAPT), and TRIUMF are hosting at the CAP Congress a mini-symposium specifically for high school teachers, where they will listen to talks covering Einstein's legacy, history



An audience of adults and students packs the TRIUMF auditorium during one of the Saturday Morning Lectures.

of modern science, and physics education. Next October, the BCAPT will host the third teachers' Professional Development Day at TRIUMF, where teachers from across the province attend lectures and take part in demonstration experiments. At this spring's Greater Vancouver Regional Science Fair April 7-9, and the Canada-wide Science Fair, TRIUMF is sponsoring several awards, including a special WYP2005 prize in conjunction with the CAP for the best physics-related project. And this year, MDS Nordion has joined TRIUMF and the BC Innovation Council in sponsoring a second high school student for the summer High School Fellowships. About 110 of the very top students in B.C. applied for the fellowships, and the two winners will spend a six-week research experience at TRIUMF in July and August.

Raising public awareness of physics is also a key mandate of the WYP2005 organizing committee. TRIUMF worked with the Vancouver Playhouse on its production of the play "Copenhagen" (about Bohr and Heisenberg's famous Copenhagen meeting in 1941) and is consulting on a new play for the Art's Club theatre July 11-23 entitled "Other Fred's". Local and national media outlets, including the CBC, have shown considerable interest in the WYP2005, with a wide variety of radio, print, and TV projects either completed or being planned. Those interested in WYP2005 should stay tuned to their local news outlets, or periodically check the TRIUMF and CAP websites for event information. • *Marcello Pavan*

For more information, visit the following websites:
 TRIUMF WYP: <http://www.triumf.info/public/wyp/>
 CAP: <http://www.cap.ca/wyp/index.asp>
 The main WYP2005 site: <http://www.wyp2005.org>

Our new guest house
is now open for occupancy!

TRIUMF House
www.triumf.info/housing

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newsletter@triumf.ca

Design/layout by D. Giasson

Important Upcoming Dates

* see insert

ACOT	Advisory Committee on TRIUMF meeting	May 6-7	TRIUMF
CAP '05	Canadian Association of Physicists 2005 Annual Congress	June 5-8	UBC
Open House	TRIUMF/UBC Open House	June 4	TRIUMF/UBC
BOM	TRIUMF Board of Management Meeting	June 17	TRIUMF
MMSEEC*	Molecular and Materials Science Experiments Evaluation Committee meeting	June 23-24	TRIUMF
SAPEEC*	Subatomic Experiments Evaluation Committee Meeting	July 7-8	TRIUMF
TSI 05*	TRIUMF Summer Institute	July 11-22	TRIUMF

TUEC NEWS

The TRIUMF Users' Group (TUG) has 319 registered members from 25 different countries. They are all involved in experimental, theoretical or engineering development projects at TRIUMF, or at international offsite projects which have a strong TRIUMF component. Each year this group elects the TRIUMF Users' Executive Group, TUEC, to manage the day-to-day affairs of the group and organize group meetings. Another function of TUEC is to provide liaison between users and TRIUMF management. Currently TUEC has the following membership:

Chair:	Jens Dilling	TRIUMF
Chair Elect:	Paul Garrett	U. Guelph
Past Chair:	Jeff Sonier	SFU
	Pierre Bricault	TRIUMF
	Alison Laird	U. York, UK
	Gerald Gwinner	U. Manitoba
	Mina Nozar	TRIUMF
	Fred Sarazin	Colorado School of Mines

The ISAC facility is now in its seventh year of successful operation, but for many aspects routine operation has not been achieved. While for some procedures this will undoubtedly happen, some procedures will continue to be unpredictable. On the one hand this is due to the fact that ISAC is pioneering new beam production methods or is operating in a power regime on their own, and on the other hand it is ISAC's mandate to provide beams that nobody else has or can. Therefore it sometimes happens that changes are necessary. The flexible and cooperative response of TRIUMF and the users is clearly the recipe for success at ISAC.

Among other things, TUEC is presently involved in various aspects of the ISAC

operation. The users are represented in the Beam Development Strategy Group by the TUEC chair. This group provides guidance to give priorities for ion source and target development. Moreover, it is consulted on the generation of the ISAC schedule. Another committee is the ISAC Operation Review Committee, where recommendations are made towards optimizing the scientific output of ISAC. This committee meets during the scheduled running periods on a quarterly basis. Progress has been made in both committees. For example, an advertisement to hire a senior accelerator physicist just went out, who will provide much needed help for the day-to-day operation. However, certain areas still require improvements.

As the 2005-2010 budget for TRIUMF is higher than the previous budget, but still significantly below what was asked for in the proposal, decision have to be made as to how the money will be spent. TRIUMF management has taken various steps but has also asked for input from the users.

Please feel free to provide TUEC with some feedback on the above topics. •

*Jens Dilling
TUEC Chair*

To join TUG or contact TUEC members, please visit the TRIUMF Users' Group website at:

<http://www.triumf.ca/tug/>

TRIUMF Beam Schedule

The current TRIUMF beam schedule is available on the Web at:

<https://admin.triumf.ca/docs/eec/>

Users should subscribe to the automated update notification to receive notice of changes which may be required during the period already scheduled.